INFLUENCE OF SUBENDOCARDIAL ISCHEMIA ON TRANSMURAL MYOCARDIAL FUNCTION.

Nathaniel C. Edwards, B.A., Albert J. Sinusas, M.D., James D. Bergin, M.D., Mirta Ruiz, M.D., George A. Beller, M.D., F.A.C.C. University of Virginia Health Sciences Center, Charlottesville, VA.

Previous studies utilizing intramyocardial ultrasonic crystals under conditions of low flow ischemia characteristic of "hibernating" myocardium, have suggested an uncoupling of the relationship between flow and function. To better evaluate this relationship we employed a nontraumatic epicardial (single crystal) pulse doppler technique, which permits complete transmural assessment of myocardial thickening. Low flow ischemia was produced in 6 open-chested dogs by partial LAD occlusion, adjusted to maintain the distal LAD pressure at 44±3% of baseline for 3 hrs. Serial measurements of thickening fraction (TF) in ischemic (IS) and nonischemic (NI) regions were obtained at 0.6mm intervals from the endiastolic endocardial surface to the epicardium (EP). The transmural flow gradient under the crystal was assessed by radiolabeled microspheres injected at baseline, and during low flow at 30 min (LF1) and 180 min (LF2). Minimal endocardial (EN) necrosis was evident by TTC staining in 3 dogs. Flow (FL) and TF were calculated for EN, midwall (MW), and EP regions. During ischemia (LF1 and LF2), changes in TF and FL correlated in EN (r=.73) but not in MW (r=.42) or EP (r=.26) segments. Values (±SEM) at LF2 depicted as a percent of baseline were: (*p<.05 vs EN)

	NI FL	NI TF	IS FL	IS TF
EN	108±16%	166±24%	22±7%	-52±14%
MW	110±18%	181±25%	49±16%	-42±21%
EP	112±20%	196±31%	73±18%*	-52±27%

Despite only a slight reduction in EP flow in the ischemic region, EP function was disproportionately reduced, comparable to that seen in the EN. Hyperkinesis was seen in the nonischemic region.

Thus, subendocardial ischemia results in an uncoupling of the transmural flow/function relationship in the ischemic region with compensatory transmural hyperkinesis in the nonischemic region.

HEMODYNAMIC EVALUATION OF THE DYNAMIC CARDIOMYOPLASTY BY AORTIC FLOW DOPPLER STUDY

Serban MIHAILEANU M.D., J.C. CHACHQUES M.D., Patrick PERIER M.D., Alain CARPENTIER M.D., Hôpital BROUSSAIS, PARIS.

Between january 1985 and march 1989, 18 pts (16 males and 2 females) had a cardiomyoplasty operation with a latissimus dorsi muscle flap (LD). LD was stimulated and trained by a Medtronic cardiomyostimulator, 9/12 survivors had a more than 6 months postoperative assessment (full trained LD) with a Diasonics DRF 100 C and a Vigmed SD 100 device. Automatically computed LV stroke volume (SV), cardiac output (CO) were obtained from the aortic flow interrogation and recorded during 5 min without stimulation and than under 1:2 cardiac cycles stimulation of the LD without any changes in the patient or probe position. The average values of the SV and CO were expressed as the percentual variation of the stimulated cycle against the non-stimulated cycle (SV) and as the percentual variation of the CO under 1:2 stimulation versus the basal state.

3/9 pts didn't demonstrated any modification of the SV or the CO ; 6/9 pts had a mean increase of SV of 25.6 % (+ 12% to + 42%) of the stimulated cycle against the non-stimulated one. CO had a mean increase of 11% (+ 7% to + 19%) between the basal state and the 1:2 cycles LD stimulation.

Full trained LD stimulation and contraction increased SV and CO in 6/9 investigated pts at more than 6 months postoperatively. Serial echo-Doppler examination seems to be the more safe and investigative method for the LD training and hemodynamic effect monitoring.

Wednesday, March 21, 1990
4:00PM–5:00PM, Room 43
Cardiac Function in Heart Failure

THE ROLE OF IMPAIRED DIASTOLIC PERFORMANCE IN DETERMINING THE FUNCTIONAL CLASS OF PATIENTS WITH HEART FAILURE

Martin R. Berk, M.D., Gongyuan Xie, M.D., Barbara Cutshaw, R.N., Anthony N. DeMaria, M.D., F.A.C.C.; University of Kentucky Medical Center, Lexington, Kentucky

The role of impaired diastolic performance in determining the functional class of pts with heart failure(CHF) remains uncertain. We hypothesized that, among CHF pts with similar ejection fractions(EF), we could identify a subgroup in whom diastolic dysfunction with diminished atrial transport was associated with reduced functional status. We studied 23 pts with CHF and EF 20% to 30% due to either coronary artery disease or cardiomyopthy. Pulsed Doppler recordings of transmitral flow velocities were obtained from the mitral annulus area in apical 4-chamber view. Measurements included peak early(E) and late atrial (A) velocities in cm/sec. Functional classification was established clinically according to New York Heart Association. On the basis of atrial transport, pts were divided into two cohorts: Group 1(normal A) with A>30 cm/sec, 14 pts; Group 2(small A), A<30 cm/sec, 9 pts. No differences were observed between Group 1 and Group 2 pts in regard to age, heart rate, and incidence or mean grade of mitral regurgitation. However, pts in Group 2 were significantly more symptomatic and had a worse functional class than Group 1 pts as follows:

Functional Class	II	III	IV
Type 1	57%	36%	7%
Type 2	0%	22%	78%

P<0.01

Thus, Doppler recordings enable identification of a subgroup of patients with advanced LV systolic dysfunction in whom atrial transport is diminished. This cohort of pts exhibits more severe impairment of functional class than pts with comparable reductions in LVEF. These data support the contribution of disturbed LV filling in the production of symptoms in pts with LV systolic dysfunction.

CONTINUOUS WAVE DOPPLER ESTIMATION OF LEFT ATRIAL PRESSURE IN PATIENTS WITH CONGESTIVE HEART FAILURE AND MITRAL REGURGITATION.

John Gorcsan, M.D., Frank R. Snow, M.D., Walter Paulsen, M.D., J.V. Nixon, M.D. Medical College of Virginia, Richmond, Virginia.

A completely noninvasive method for determination of left atrial pressure (LAP) in patients with mitral regurgitation utilizing continuous-wave Doppler echocardiography has been devised. This technique was applied to 34 patients, aged 60±15 yrs, (LVEF 26±10%) with congestive heart failure and Doppler-detected mitral regurgitation, and correlated with simultaneous catheter recordings of pulmonary capillary wedge pressure (PCWP) at end-expiration. Patients with aortic stenosis or LV outflow tract obstruction were excluded. LAP was estimated by first determining transmitral pressure gradient (P) from continuous-wave Doppler measurements of mitral regurgitant jet velocity (V), using $P=4V^2$; then subtracting P from simultaneous measurements of cuff systolic blood pressure (SBP), (SBP-P=LAP). Five of the 34 patients had inadequate Doppler tracings and were excluded. For the group, peak mitral regurgitant jet velocity was 4.5± 0.8 m/s, peak SBP was 113±27 mmHg, and mean PCWP was 29±8 mmHg. Correlation of noninvasive estimates with mean PCWP was r=0.9, SEE±4 mmHg, p<0.001, y=0.8x +7. In conclusion, continuous-wave Doppler echocardiography and systolic blood pressure may be used for accurate noninvasive estimation of left atrial pressure in patients with congestive heart failure and mitral regurgitation.